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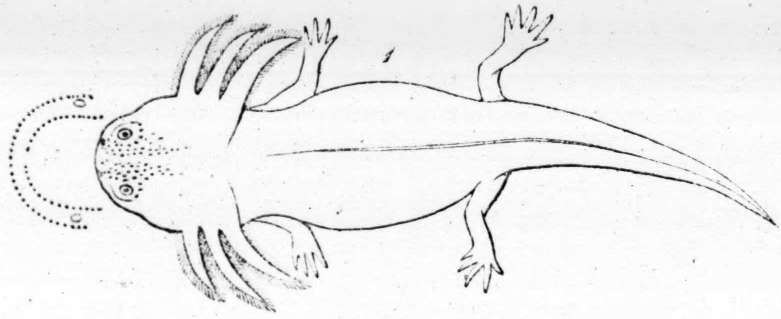
Observations on the Metamorphosis of Siredon into Amblystoma.

BY. O. C. MARSH.*



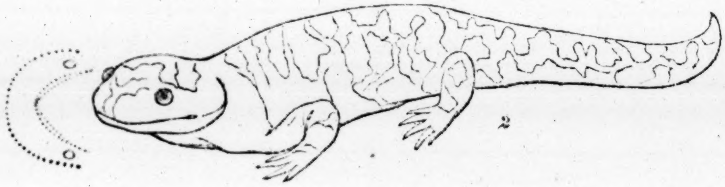


Fig. 1. Undeveloped larva of Amblystoma Mavortium of Baird, hitherto known as Siredon lichenoides of Baird (half natural size).

Fig. 1 *a*. View from below, showing the arrangement of the maxillary and palatine series of larval teeth and inner nostrils of the same.

Fig. 2. Amblystoma Mavortium developed from Siredon lichenoides: metamorphosis apparently completed (half natural size).

Fig. 2 *a*. Maxillary and palatine teeth of the same after metamorphosis.

WHILE on a geological excursion to the Rocky Mountains, during the past summer vacation, the writer obtained at Lake Como, in Wyoming Territory, a number of specimens of Siredon lichenoides, one of the most interesting forms of the Urodela, or tailed Batrachians, and one hitherto but little studied. This lake is a small shallow sheet of water, distinctly brackish, or "alkaline," apparently from the salts of soda. It lies near the Union Pacific Railroad, about 640 miles west of Omaha, and at an elevation of about 7000 feet above the sea. The surrounding region is an arid desert, with little or no vegetation, except cactus and wild sage.

The siredons obtained at this locality, where the species, known as the "fish with legs," is quite abundant, showed at first no differences,

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* Reprinted from the 'American Journal of Science and Arts,' and communicated by the Author.

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except those of age and sex. They were from five to ten inches in length, of a uniform dark olive, or pistachio-green colour above and a light olive below. The vascular fimbriæ of the external branchial appendages, or gills, were black. In form and general appearance all the specimens corresponded essentially with the one represented in fig. 1. They were brought to New Haven alive, apparently without suffering much inconvenience, either from a transfer to fresh water or from the long journey. They all fed readily upon worms and insects, and occasionally came to the surface and inhaled air. More rarely an exhalation occurred, usually under water. On being removed from their native element they soon showed the same signs of distress as fishes under similar circumstances, although in a much less degree.

The account recently published by Prof. Duméril of the remarkable metamorphosis of the second generation of axolotls (*Siredon Mexicanus*) from the table lands of Mexico, while kept in the Museum d'Histoire Naturelle, in Paris,* made it a point of no little interest to determine whether this species also would undergo a similar change when placed under different physical conditions, and hence the specimens were watched with considerable care.

The first indications of any change were observed in one of the smaller specimens, about six inches in length; and the metamorphosis had apparently commenced during the journey from Lake Como to New Haven, which lasted about a week. Small round spots of dark brown were first noticed on the sides of the tail, and the colour of the entire animal gradually assumed a darker hue. The broad thin membrane along the back, and above and below the tail, gradually began to diminish by absorption, the external branchial appendages soon became similarly affected, especially at the ends, and the animal came more frequently to the surface of the water for air. As the change went on the dark spots increased in number and size, and gradually extended over the whole upper part of the body. The membrane on the back and tail entirely disappeared, leaving in its place in the dorsal region a sharp groove. The branchiæ also continued to diminish, and at the same time the internal branchial arches began to be absorbed, and shortly after the openings on the neck closed up. In the meantime the head became more rounded above and more oval in outline, the muzzle narrower and more pointed, and the eyes more convex and prominent. The body also decreased in bulk, and the costal grooves became more distinct. The thin external skin was shed, and the secretion of mucus from the surface sensibly diminished. During these changes the animal showed an increasing desire to leave the water, often remaining for some time with its external nostrils above the surface, and occasionally making violent struggles to escape. Aided by a heavy rain at night it at last succeeded, and thus put an end to further observations, just at a time when it had lost the generic characters of Siredon and become a true Amblystoma, two forms of Batrachians usually regarded as belonging to distinct families.

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* 'Comptes Rendus,' tome lxi., p. 775, 1865; and tome lxv., p. 242, 1867.

Fortunately, a few days later, several other specimens of various sizes began, nearly at the same time, to show unmistakable indications of a similar transformation, and this afforded an opportunity of noting the successive phases of the change more fully, as well as of observing the physical conditions which seemed to promote or retard it. Two of the specimens were placed in a glass jar, and left in a strong light, and five others were kept in a cooler place in the shade, the temperature of the two, however, differing but a few degrees. At the end of three weeks those in the glass vessel had apparently completed their metamorphosis, while of the others less favourably situated three only were partially altered, and at the present time, or nearly three weeks later, they still retain tubercular remnants of the external branchiæ, although in most other respects the change appears to be complete. The two remaining specimens, however, which had throughout been kept with the three last, showed no distinct signs of changing, although the probability of their doing so, and the importance of retaining some tangible evidence of the original condition, led to the transfer of one of them to a jar of alcohol after the first week, a precaution, as the result showed, quite unnecessary in the case of the other, which at the time of writing (October 5th, 1868) still remains a typical siredon, with no alteration more important than a single appearance in a new epidermis.

The changes observed in the five specimens that underwent the complete metamorphosis were essentially the same as those noticed in the one already described, although in no two individuals were the successive phases quite contemporaneous or identical. The most marked differences observed were in the colour, both during the transformation and after its completion. This was very noticeable even in specimens exposed to the same physical conditions. In the siredon state all were apparently precisely alike in this respect, and the first indications of change detected in each case was the appearance of the small dark spots along the sides of the tail. From this stage onward the variation in colour in different individuals became very marked. Of the two specimens exposed to a strong light in the glass vessel, one rapidly became covered with dark spots, especially on the back and sides, until finally these predominated, and the grayish yellow of the ground colour only remained in vertical and irregular patches, the rest being a greenish black. The companion of this specimen, however, although apparently equally advanced in development, retained for some time nearly the original siredon colour, the only difference being some irregular blotches on the sides, to which the specific name lichenoides would very appropiately apply. These were the extremes of colouring after the change, the other specimens showing various intermediate grades, one individual having dark brown spots on a light olive ground. All the altered specimens, it should be stated, apparently belonged to the species Amblystoma Mavortium, as recently defined by Prof. Cope, in his able Review of the Amblystomidæ;* and it is an interesting fact that among the six specimens that have already changed the present coloration appears to indicate two, if not three, of the forms which he there regards as varieties, although previously considered as species by other eminent authorities. In this place should perhaps be mentioned a remarkable change of colour which took place in one of the siredons before any indications of metamorphosis had been detected. The animal had been in the dark for several days, and was then placed in a white porcelain vessel, and kept for several hours in a strong light, while an attempt was made to photograph it. During this time it changed from the dark siredon colour to a very light yellow. The next morning the original colour had returned, but a second exposure produced the same change, which was as speedily reversed on returning the animal to the dark, although it evidently suffered considerably from the treatment. Even a moderately strong light appeared to be distasteful to all the siredons, and they usually sought the darkest part of the space in which they were confined.

The second distinct phase in the metamorphosis, which, however, commenced in every instance before the change in colour had made much progress, was the absorption of the dorsal and caudal membranes. This began on the lower margin of the tail, and soon after could be detected in the dorsal region, and then farther back, the last portion remaining being usually on the upper part of the tail. The absorption extended below the dorsal surface, leaving at first a groove along the back, marking the position of the membrane; and as this disappeared the light-coloured specimens retained in its place a narrow black line, which extended also to the end of the tail.

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* Proceedings Philadelphia Acad., xix., p. 166, 1867.

The absorption of the external branchiæ was the next marked feature in the transformation, although this also commenced before the changes just mentioned were completed. The atrophy apparently began at the extremities of the branchial processes, and when these had diminished to about half their natural size, and the fimbriæ had disappeared, the ends rolled up underneath, leaving the remnants as rounded tubercles, which, in some of the specimens remained long after all the other stages of the transformation were passed. The absorption, moreover, did not always proceed with equal rapidity on the two sides of the same animal, but in one instance stumps of the processes were retained on one side some time after those on the other had disappeared. During the diminution of the external branchiæ, the internal vascular arches which support the external processes also became absorbed. As these disappeared the orifices on either side of the neck and the open fold of the throat became closed by the adhesion of the opercular flap to the surface below, leaving, especially in the gular region, a deep cicatrix. These changes, which were in each case apparently completed before the remnants of the external branchiæ had disappeared, were evidently the main cause of a marked alteration in the shape of the head, which occurred about the same time. In the siredon state the head is broadest at the base, and comparatively flat above, but after the loss of the branchial arches its greatest breadth was a little behind the eyes, while it was much more rounded above, and in outline more oval. The neck also diminished in size, and the snout became more pointed. The change in the eyes, already alluded to, likewise altered the appearance of the head materially. The flat, fish-like eye of the siredon projected very slightly above the surface of the head, but during the transformation this organ became more convex, and also much more prominent. This change in the eye was apparently indicated also in the habits of the animal. The siredons seldom missed their aim in catching a worm or insect, but when under water after the metamorphosis they often made several ineffectual attempts to seize objects quite near them.

One of the most interesting features of the transformation occurred in connection with the mouth of the animal. The opening, or gape, increased considerably in size, one half at least: the internal and external nostrils became perceptibly more distended, and the tongue, which was at first small, enlarged so as nearly to cover the entire floor of the mouth. An important change also took place in the teeth. In the siredon the palatine series on the vomerine and pterygoid bones formed an arch nearly concentric with the maxillary row, and extending forward between and beyond the inner nostrils. The arch is interrupted in front, and to some extent on the sides, as represented in figure 1 *a*, which shows the position of these teeth, but not their exact number or size. After the metamorphosis the palatine series project farther from the roof of the mouth, and become much more transverse, forming an obtuse angle instead of an arch, with the interspaces nearly or quite united. The maxillary series also form a somewhat narrower arch, corresponding to the more pointed snout of the Amblystoma, and the splenial teeth of the lower jaw have gradually disappeared. These changes in the dental series, it should be stated, were not in all cases perfectly uniform in different individuals that had apparently passed through the same external phases of transformation, although the tendency was all in the same direction; and hence it is not unlikely that the palatine teeth of some, at least, of the specimens examined, may eventually become still more transverse than those represented in the figure.

Among the other more important changes which occurred during the metamorphosis may be mentioned the decrease in the size of the entire body, which was very marked, a perceptible increase in the distinctness of the costal grooves corresponding to the vertebræ, and the gradual ossification of the carpus and tarsus. The feet also became less palmate, and the toes less depressed. During the transformation, moreover, and especially after its completion, all the specimens shed the thin, transparent epidermis, some of them very frequently; one, indeed, which had been kept in a strong light, lost this covering three times in the ten days immediately following the metamorphosis.

The change in the habits of the siredon in passing into the Amblystoma state was scarcely less marked than the alteration in its physical characters. As soon as the absorption of the external branchiæ commenced the animal came more frequently to the top of the water and took in a mouthful of air; and not long afterwards would occasionally float for some time at an angle of about 45°, with the external nostrils above the surface. Frequent efforts to leave the water soon followed, and an opportunity of so doing was in most instances speedily improved, and the change then seemed to progress more rapidly. One or two specimens, however, showed for some time, especially in cool weather, much less inclination to desert their native element, apparently suffering little or no inconvenience from remaining under water, if allowed to come to the surface about once in five minutes. The pugnacious propensities of the siredons, which at first led to occasional assaults on one another, appeared to diminish as the change progressed, and the more sluggish nature of salamanders at last predominated; but the altered forms at times showed no little celerity of movement, and when irritated, especially when held by the tail, would often turn and snap at the hand with a rapidity that would have done no discredit to a reptile of much higher organization.

The effect on the metamorphosis of a variation in light and temperature has already been alluded to. During a succession of very warm days, about the 1st of September, the change progressed with great rapidity, but it apparently ceased, or made very slight progress, in the cool week that followed. While, moreover, the two specimens most favoured in regard to light and warmth passed apparently through the entire transformation in about twenty days, those which commenced at the same time, but were less favorably situated, required at least twice that time for its completion. The only living specimen still remaining unchanged has twice shown slight indications of an approaching metamorphosis, but with the exception of some spots, these have apparently soon disappeared after a transfer to a dark and cooler place.

Inasmuch as this species of Amblystoma appears to have never before been studied from living specimens, and especially as its larva (hitherto known as Siredon lichenoides) has but very rarely been met with, it may be well to mention some of the more important characters noticed in the individuals just described, in addition to those given in the original description of the two forms, when the connection between them was unknown. It should, perhaps, be first stated that, after the observations here recorded, it becomes at once evident, on examining Prof. Baird's excellent description and figures of Siredon lichenoides,* that the specimen on which the species was

* Stanbury's Exped. to the Great Salt Lake, p. 336, 1855.

founded cannot be regarded as a typical larva, as it had already made considerable progress in its metamorphosis. This appears to be distinctly shown in the colour-markings, which suggested the specific name, and likewise in the dorsal and caudal membranes, which have apparently been materially diminished by absorption. The evidence of partial transformation seems to be equally strong, also, in the case of the specimen from Nebraska, subsequently figured and described by Prof. Baird under the name Siredon melanosticta, which is possibly only a variety of S. lichenoides.* The coloration, the irregular outline of the membranes, the rounded extremities of the branchial processes, as well as the arrangement of the palatine teeth, all indicate that the animal figured had already entered upon the preliminary stages of metamorphosis. In each of these cases, however, it is not improbable that the alteration may have been temporarily, or possibly even permanently, suspended before the animal was captured. Aside from the features which may be the result of partial transformation, the siredons from Lake Como do not differ essentially from Prof. Baird's original figures of S. lichenoides, except in having a somewhat broader head, and in not having the dorsal membrane extend to the occiput, differences which may be due merely to locality, as the type specimen came from a point about four hundred miles farther south.

The siredons obtained at Lake Como, as already stated, were from five to ten inches in length. The colour of the body is a very dark olive above and a light olive below, while the fimbriæ of the external branchiæ are nearly or quite black. On either side of the body are twelve costal grooves, not including the inguinal. The skin is smooth and transparent, and shows beneath it the ends of innumerable glands, thickly crowded together. In specimens preserved in alcohol these glands project, making the surface appear granular. The dorsal membrane commences a short distance from the base of the head, and both this and the lower membrane extend a little beyond the end of the tail, thus making the extremity slightly emarginate. The carpus and tarsus are unossified. The digits are broad at the base, depressed and triangular. The fourth toe is longest, and has four phalanges. The head is broad and flat, and the muzzle rounded. The external nostrils are smaller, and slightly nearer together than the interior nasal openings. The eyes are round, and the iris of a yellowish metallic lustre. A series of mucus-pores begins near the inner margin of each of the external nostrils, and diverging slightly extends over the nasal and frontal regions. Opposite the eyes they each connect with an orbital series. Another series, less distinct, exists on either side of the throat, just below the ramus of the lower jaw. Of the four branchial arches, only the three anterior support external processes, and the latter are thickly studded on their lower surfaces with lamellar fimbriæ. The maxillary and palatine series of teeth have already been mentioned. The former consists of a single row of slender pointed teeth on the premaxillary and maxillary bones. The palatine arch of teeth, situated on the vomerine and pterygoid bones, forms a narrow and more complex series. The teeth of the lower jaw consist of a single row on the premandibular bones, and an adjoining and somewhat more complex series on the splenial bone. The two close in between the maxillary and palatine arches when the mouth is shut.

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* Pacific Railroad Report, vol. x., plate xliv., fig. 1; and vol. xii., part 2, p. 306.

The following measurements are taken from two of the Lake Como siredons. No. 1 is the individual figured at p. 1569, and No. 2 a specimen preserved a short time in alcohol.

MEASUREMENTS.

	No. 1.		No. 2.	
	Inches.	Lines.	Inches.	Lines.
Length from snout to end of tail	7	9	8	
„ gular fold	1	1	1	1
„ armpit	1	8	1	9
„ groin	3	9	3	10
„ behind anus	4	4	4	5
Width of head where greatest	1	3	1	4
„ tongue	-	-		8
Distance between eyes anteriorly		7		7
„ outer nostrils		5		5
„ inner „	-	-		6
Length of anterior branchial process		8		7
„ posterior „	1	2	1	2
Distance between outstretched toes	3	9	3	8
Height of tail, including membranes where greatest	1	3	1	3

Before the transformation was entirely completed, the generic characters of Amblystoma had become unmistakable; although in each instance—as not unfrequently occurs in nature—some of the characters which distinguish the species had already preceded them. Among the altered forms, developed from larvæ apparently identical, the two types of coloration have each at present two representatives, and are sufficiently distinct to merit a more particular description. The former has a ground colour of greenish black, on which are bands or patches of grayish yellow, more or less confluent, especially along the back. The abdomen is dusky olive, with a darker medial band. The latter type clearly corresponds to Amblystoma maculatum, which is regarded by Prof. Cope as a variety of A. Mavortium. In this form the ground colour is light olive, on which are scattered numerous small brown spots. In each specimen a few of these first appeared on the tail, and next four of larger size on either shoulder, and subsequently others on the sides. The specimens of this type are also larger and more sluggish in habit than the other variety, and until very recently would have been considered distinct species by all herpetologists. In most other respects, however, there is little or no difference between the two forms, and both of them, with one other specimen representing an intermediate grade, must apparently all be regarded as belonging to Prof. Baird's species, Amblystoma Mavortium.*

At the time the siredons here described were obtained at Lake Como several others also were secured by Prof. Eustis, of Harvard College. All were brought to New York together, and there separated, part being taken to Cambridge, where they have since been carefully observed by Professors Wyman and Eustis, and the rest brought to New Haven by the writer. The former specimens, however, strange to say, have shown but very little inclination to change, none having commenced so doing until after several of the latter had fully developed into Amblystomata, and only the smallest, about five inches in length, having just completed its metamorphosis. This individual, as Prof. Wyman informs the writer, seems still to prefer remaining in the water, —doubtless owing in part to the cool autumnal weather,—although it is there exposed to attacks from the large siredons, one of which has twice attempted to swallow it—an interesting fact illustrating the habits of the species. Two of the siredons kept by Prof. Eustis escaped during a rain storm, and six days afterwards one of them was found still alive, although shrivelled up and the branchiæ partially gone. On being placed in water it refused food, and soon died. That siredons of apparently this species are occasionally found in wet grass near the water, especially after thunder showers, had already been noticed by Dr. Suckley,* but that they can remain out of water for several days is a new and important fact, showing that even before metamorphosis the lungs are sufficiently developed to sustain life without the aid of branchial or dermal respiration.

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* Journal Acad. Nat. Sci. Philadelphia, 1849, p. 292.

Whether this species of siredon ever changes at Lake Como, and in other similar regions, is an interesting question, and one that cannot, perhaps, at present, be answered with certainty. That it does so occasionally, however, under favorable circumstances, especially when young, several facts known to the writer would seem to indicate, although Dr. Suckley, one of the few observers who have hitherto examined it in its habitat, regards it as probably permanently aquatic.† In the elevated region where Lake Como is situated, although the weather in summer is quite warm, the nights are always cool, and the changes of temperature often sudden and very great; hence the metamorphosis, if it began, would probably proceed slowly, and be liable to suspensions during its various stages. That the species, however, breeds in the siredon state, like the Mexican axolotl, there can be little doubt, although direct evidence on this point appears to be wanting. The observations of Duméril, already alluded to, and other similar facts, render it probable that after reproduction the power of complete development would be lost, although alterations in colour and other minor changes might still occur.

The near approximation in many Batrachians of the periods of reproduction and metamorphosis, and the effects, especially upon the latter, of even slight differences of physical conditions, as shown in the preceding instances, are known to produce when combined remarkable variations in the same species, as well as other results until recently quite unexpected. The bearing of these and similar facts on a theory of development, although an inviting topic to enter upon, cannot, for various reasons, be discussed in this connection, but it is evident that in this direction lies a rich field for further investigation. The observations here recorded, however, when taken in connection with those of Duméril on the Mexican axolotl, render it extremely probable—as Cuvier long ago seems to have suspected‡—that all siredons are merely larval salamanders, and also suggests a doubt whether some, at least, of the other so-called Perennibranchiates (by no means a natural division of the Batrachia) may not prove eventually to be the undeveloped young of well-known species.

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* Pacific Railroad Report, vol. xii., part 2, p. 306.

† Loc. cit.

‡ Recherches anat. sur les Reptiles, &c., Paris, 1807, p. 35.

In addition to the acknowledgments already made, the writer desires, in concluding, to express his thanks to General W. Snyder, Superintendent of the Union Pacific Railroad, for his kind assistance in securing the siredons at Lake Como in August last; to his friend Prof. E. D. Cope, of Philadelphia, for various suggestions in regard to the subject here treated of; and likewise to his friend Prof. George F. Barker, of Yale College, for careful observations on the specimens while he was temporarily absent from New Haven.

O. C. MARSH.

Yale College, October 10, 1868.

'*Letters Home.*' By the Rev. HAMLET CLARK.

[When, in 1867, I published a brief notice of this interesting little book in the 'Zoologist' (S. S. 997) I was absolutely compelled, from want of space, to cut out and omit the extracts given below. I knew too well the interpretation truthfully given to such phrases as "want of space," "crowded out," "unavoidably postponed," "great press of matter," and so forth, to pen either of these "formulæ for the confession of editorial poverty," and so quietly laid by these extracts for the "more convenient season," which has now arrived. They lose none of their original freshness from having been deferred for fifteen months; and I am sure it will be a sincere pleasure to many of my readers to be thus agreeably reminded of one they loved so well as my friend Hamlet Clark.—*Edward Newman.*]

Fire Flies.—This is a pleasant boarding-house in the very midst of the wood, with virgin forest on all sides of us, and plenty of insects even in the rainy season. I have been out two or three evenings, hardly with the expectation of getting anything, but for the sake of seeing the fire flies. It is no figure of speech to say that on still evenings, especially after a rainy afternoon, they eclipse the stars; their lights are of all sizes and magnitudes, and more than one colour. The large Elateridæ of the genus Pyrophorus have a brilliant, steady and very bright light: these are difficult to catch, inasmuch as they sail slowly round the tops of the high trees, looking exactly like wandering planets; others, smaller but of brilliant lustre, fly hither and thither among the brushwood (also Pyrophori perhaps, at all events Elateridæ and not Lampyridæ, like our English glow-worm), quite within reach of one's net; only to rush after their lanterns in the dark would incur the risk of broken bones: all I can do is to admire.

There are other species also, more nearly represented by our English glow-worm, that haunt especially damp situations; on one side of the road leading to the house is a deep gully, conducting a little stream to a small lake of water: this road, on such evenings, presents a marvellous sight—the whole of the gully is lighted up with thousands of sparks. I am not romancing, they are in thousands; and the wonderful part of the sight is, that while many of these rank and file evidently wander only according to their individual will, there are others, and these the majority, which keep perfect time and sway in their flashings one with another! For perhaps twenty yards you see every light (of this *second* set of lights) evenly and slowly flying in one direction; then all at once in a moment every light will vanish; in the next moment every light flashes forth again, and progresses in another direction: it is impossible to resist the conviction that all are acting in harmony and conjunction with each other, and that the impulse of forward progression and then of a momentary obscuration of light, and then again of a brilliant simultaneous flash and another onward movement at another angle, is felt by each individual and directed by one, the leader of the brilliant well-drilled band. The sight (when one remembers that these are insects, and not birds or beasts) is quite startling, so complete is the precision of united action, and so continuous! going on, for anything I know, all the evening or all night long: I can call to mind no parallel to it, not even an actual parallel in birds or fishes!—p. 149.

Cetoniadæ and Lucanidæ.—My night excursions have supplied to me a fine series of two not uncommon but handsome and characteristic Brazilian species, one of the Cetoniadæ and one of the Lucanidæ. There is a little clump of dwarf bushes by the side of the rivulet, on which, by accident, I threw my bull's-eye light: I saw a couple of fine beetles, somewhat allied to our stag-beetle, which had just alighted on an outside twig, obviously with some distinct intention. I let them alone and watched them; they travelled quickly along the twig, down the branch, down the stem, till they got nearly to the ground, and then I discovered their object: the little stem was bleeding, giving forth gummy sap from some cracks in the bark; round this were collected three or four specimens of beetles and a few moths; the former I carefully secured; and by marking the bush and searching during daylight for others like it, and then examining each occasionally when the weather invited an evening stroll, I managed to get a fine series of examples.—p. 151.

Resinous Sap attractive to Insects.—I think I never mentioned to you one of the interesting sights that we always took care to inspect whenever we ascended the aqueduct road from Botofogo. There was near the roadside a large tree standing by itself in the sunshine; towards the top of it a branch had been torn off by the wind, and the wound gave forth a stream of dark resinous sap, which ran nearly down to the ground: this resinous sap was a very favourite haunt of Lepidoptera and Coleoptera, and indeed of all orders. The butterflies were the most showy visitors, of course; they were not the smaller weakly winged species that haunt the footpath, but magnificent fellows, with wings almost as strong as a bird's, that swept down from the heights above, and condescended to approach the earth only to visit some hospitable tree like this, which is keeping open house to all the insect world. Of the beetles, the most prominent were splendid fellows of the longicorn genera Trachyderes, Lissonotus, &c., very common, but very handsome; besides these were dangerous looking giants of Ichneumons and smaller Diptera, &c., without end: but, alas! though the visitors to the tree were so abundant, they were unavailable for us; the sap was unfortunately in the blazing sunshine, and this made every creature so alert (and withal many were so high up the trunk) that we soon found that to capture them was hopeless. But I always made a point of visiting the tree: by creeping up slowly and keeping as much in shade as possible I could watch the revellers without causing much alarm; the tree was manifestly a well-known luncheon-room for all insects whose morning duties led them into that part of the forest; they kept coming in from all quarters and going away in all directions; the big butterflies were fussy and unneighbourly, running up and down in the sunshine and disturbing all around them; the beetles, though lively enough on occasion, were more demure, and sedulously attended to the main object of their visit. I wonder what all those creatures think of each other; they do not gossip, like ants, but they make way for each other, and the manifestation of alarm by one is at once accepted by all in his neighbourhood. The Ichneumons are unpopular among the insect tribes; everybody gives one of them a wide berth, and interchange of civilities, as between butterflies, are of the curtest: one big black or steel-coloured gentleman is so obnoxious that as soon as he alights everyone in that neighbourhood departs. What a vast deal there is for us to learn! these creatures, I suppose, have their traditions, and if not traditions (by these I mean, of course, the natural tendencies that they derive from their parents), their own personal experiences. *I* know they are right about those Ichneumons, perfectly right; but how do *they* know it? How do those little creatures know that the steel-coloured Ichneumon would as soon have a luncheon off them as off the gum, perhaps prefer them! or indeed that he in *his* experience of life visits this tree in the full expectation of being able to get a wholesome meal off one or two flies; or do they know it at all? and why, when they cannot endure the shadow of a carnivorous fly, will they permit without difficulty the blundering swing of the antennæ of a Trachyderes right across their bodies, or let a big Papilio almost walk over them? There is a degree of discrimination in all these actions that is quite superior to the instinct of, we will say, a Chlamys, which on the approach of danger makes itself in an instant exactly like a bit of caterpillar's dung! That is inexplicable enough, but that is simple and uniform; the rule of life among the Chlamidæ is, "if ever you are in the least frightened, roll yourself up as tightly as you can;" it is their misfortune or their good fortune that the result is that the sight of them would turn the stomach of any respectable bird on the hunt for food. To this rule there is no exception; a harmless butterfly accidentally touching them would metamorphose them into an unpleasant-looking cylinder just as soon as the touch of my very dangerous finger and thumb. But here on this gummy tree, the rendezvous of insects, you find something very superior to this; there is a discriminating power which is always exercised aright, and which seems very much like the result of memory and of experience: certainly the absence of any such discriminating power might be in a moment fatal, putting an end to all experiences: it is the quick-witted who live, it is the dullards who are food for Ichneumons; although whence they got their wits I can tell as little as I can tell why the old hen partridge makes her brood cower down in the stubble at the sight of a distant hawk, while she cares nothing at all for fifty crows or gulls; all that is evident is, that such knowledge is essential to preservation of life, and that such knowledge has been imparted to them by their Creator.—p. 152.

Notes on Bird Parasites. By JOHN CORDEAUX, Esq.

THE theory that every distinct species of bird has its own characteristic parasite, is probably a correct one. Comparatively little has yet been done in this branch of Entomology, and excepting the magnificent work of Mr. Denny,* there is not, as far as I am aware, any treatise or work on the subject.

During the last year I have microscopically examined and taken drawings of the parasitic insects infesting about sixty species of birds, many of them now extremely rare in Great Britain: for these I am indebted in a great measure to Mr. J. H. Gurney, jun., who has very kindly, from time to time, forwarded specimens taken from various birds lately added to his valuable collection. Others, again, have been taken from birds shot by myself in this district. The observations recorded in this paper have been jotted down at various periods during the year in my note-book, and I now bring them together, trusting they will interest my readers. As I possess, however, but a slight knowledge of Entomology, I can make no attempt at a scientific description of these insects.

These minute creatures belong to the Louse family, the genus Pediculus of Linnæus. They are found, in greater or less numbers, concealed amongst the feathers of birds, whose blood they suck. Their life is intimately connected with that of the bird; they cling to it in summer and winter, in sunshine and storm, accompany it in all its many migrations and wanderings, are often carried to the bottom of the sea, and at last, when it dies, they lingeringly perish.

With two exceptions, the parasites belonging to the sixty species of birds examined are distinct. Some, indeed, are very closely allied and have a general resemblance, but when placed side by side on a glass slide and carefully compared they differ considerably. The exceptions are in the parasites of Sabine's snipe and that of the common species (Scolopax gallinago), and those of the rock dove and domestic pigeon: in both cases these insects appear identical, a careful examination failing to detect any difference.

There is one small insect, however, which I call a "tick," common to all birds alike. I have examined specimens taken from widely different species—skuas, redshank, gannet, glaucous gull, whimbrel, green plover, golden plover, &c. They are not always present, but may be occasionally detected: for instance, in ten golden plovers I could find only two; a single green plover afforded about a dozen. They are usually found concealed amongst the small feathers of the head and neck, differing in this respect from the true parasite, which may be found all over the body. These "ticks," although inhabiting so many widely different species, are identical—to sketch or describe them would be mere repetition. The head is triangular, broad at the base, with the apex somewhat prolonged, forming a sucking mouth; there are six short legs, three-jointed, and armed with acute single claws: these claws are moveable and close between two small projections, thus forming a very efficient forceps: they cling by this means to the barbules of the feather with great tenacity, and are extremely difficult to detach. Compared with the true parasite they are a slow, sluggish moving insect, and, placed on a smooth slide of glass, as helpless as the famed Italian knights who, overthown, lay immovable in their heavy armour, like lobsters. The true distinctive parasite is a very nimble fellow, running rapidly, even over a smooth surface: their feet seem to be used in quite a different manner to the "tick's"—in the one case formed for grasping, in the other for progression. The abdomen in the "tick," at its juncture with the short thorax, is as wide as the base of the head, but gradually increases in width for two-thirds of its length, and then rapidly contracts. The sides of the abdomen from thorax to extremity are encased with horny plates, overlapping at the angles of the body, but disconnected towards the centre: these plates are pierced along the lower edge with minute round holes for half their length: in the remainder of the plates, towards the centre of the creature's back, which is uncovered, the edges are only scalloped: it is difficult, however, to give a clear idea without drawings. The body and six legs are thinly covered with long hairs; there are two many-jointed feelers placed one on each side of the head, and just above them respectively a smaller process, the use of which I cannot determine. These creatures are remarkably tenacious of life: I have found them, after having been gummed to paper and passed through the post, quite lively. But the most remarkable instance of vitality was shown in one taken from a hooded crow: one evening I fastened this insect with a little gum to a glass slide, purposely leaving its head and thorax free, the better to see the construction of its legs: six days afterwards, on placing the slide under the microscope, I was astonished to find it as active as ever, and struggling to free itself from the gum. These "ticks" are uniformly of a bright brown or burnt-sienna colour.

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* 'Monographia Anoplurorum Britanniæ, or an Essay on the British Species of Parasitic Insects.' 1842.

With the exception of these "ticks," which appear common to all alike, I believe it will be found that every species of bird has its own distinct and characteristic insect. A batch of parasites taken from a bird and placed on the same slide, side by side, and examined together, will occasionally show certain well-marked differences: when I first became aware of this fact I thought they might probably be referable to distinct species; but after examining every parasite I could detect on certain birds, have come to the conclusion that these differences are due to age and sex. I have no doubt that totally distinct parasites may be found on some birds, nor do I indeed well see how this can be otherwise, although I have not yet, except the "tick," detected more than *one kind of parasite on each species.* In the eagles, hawks, &c., preying on other birds, and in the crowded breeding colonies of sea-fowl, also in many other ways, an interchange of parasites might be effected. In handling or skinning a bird infested with these small creatures I have frequently found them running over my hands and fingers. Birds, again, of different species, packed together in the same box or hamper, might in this way alone produce two or three distinct forms.

The size of these minute insects is not by any means proportioned to the relative size of the particular species of bird they inhabit. We might naturally suppose the larger the bird the larger the parasite: the very reverse is often, however, the case. The parasite of the golden eagle is remarkably small and much below the average; that of the ring ouzel is very large, the head alone being equal in bulk to the entire parasite of the eagle. The parasite of the merganser is about equal in size to the golden eagle's, while that infesting the ice duck is fully ten times its bulk. The smallest I have yet examined is that of the little auk—one-third less than one taken from a bearded tit.

Closely-allied species of birds have very often very opposite parasites: those of the common and velvet scoter are totally distinct, and in no one point resemble each other. There is, on the other side, often a strong resemblance between these insects when the species they infest are widely distinct. The parasites of the peregrine falcon and reeve are strikingly alike.

Bird parasites may be divided into two classes, the long-headed and the broad-headed: there are many gradations between these two types. In the long-headed the head resembles the spade on a playing-card, but narrower; that of the broad-headed kind may be likened to that of a true British bull-dog, and has a most determined and ferocious expression: the mouth in these creatures is under the head, the flat eyes on the upper surface, and placed on each side in a slight cavity: these eyes are very conspicuous in the parasite of the green plover, and in this species are of a blood-red colour: the abdomen is made up of segments, varying in different species from six to nine; the legs are three-jointed, terminated with a wrist (?), a pad and ten sharp crooked claws. The antennæ are placed on each side of the head; they are four-jointed, but vary in different species: these antennæ are often placed in a notch on each side of the head: this is particularly the case in the long-headed sort. The insects are usually, in a greater or less degree, covered with hair. In the parasite of the turnstone the abdomen is very thickly covered with hairs: those of the eagle and snowy owl are also very hirsute; others, again, as in the greenshank and little gull, are comparatively free from hair.

Parasites are far more commonly found on some species than on others: they are common on the birds of prey and also on some kinds of sea-fowl. The fulmar petrel is very subject to them. The Corvidæ also often swarm with these creatures: this is particularly the case with the hooded and carrion crows. They are few, and rarely found, in the golden plover, and more rarely on the snipe: I have frequently searched numbers of these birds without detecting a single insect. What part they play in the economy of the bird, and whether they effect it for weal or woe, it is difficult to determine. I find, as a rule, that where a bird is in an unhealthy state, very poor, or suffering from some old injury, that then they are most numerous. This is also the case with some mammals: the sheep fag is always most abundant when sheep are in poor condition, or have been shrinking, and when cattle shrink they often become lousy. I have seen birds so infested with these creatures that life must have been insupportable: they swarmed like ants in an ant-hill, and must undoubtedly have exercised a prejudicial effect on the life of the bird. Birds in the highest condition I have found invariably the freest from parasitic insects.

The eggs of parasites are usually attached to the feathers. In a fulmar petrel the eggs or egg-cases were very firmly attached to the shaft of the feather, some of the barbs being enclosed. Under the microscope this egg appears to be built up of small particles, like a martin's nest.

There is a great field for investigation in connection with these minute parasitic insects: I trust, therefore, that these few remarks may induce some of my readers to take up the subject and prosecute the inquiry. If it becomes an established fact that every species has its own characteristic parasite it would be interesting to know whether a species having a wide geographical range and inhabiting opposite climates afforded the same parasite, or whether closely-allied species or varieties of a species exhibit any difference in the insects infesting them. For instance, it would be important to compare the parasite of the common jay with that of the blackheaded jay (*Garrulus melanocephalus*) or the Himalayan bird; that of the jackdaw with the black jackdaw (*Corvus monedula-nigra*); the coot of Europe with that of Southern India, and scores of other instances where birds are identical, varieties or closely-allied species. In making these comparisons it would be necessary, however, to examine every parasite that could be found not only on one bird, but many of the same species; otherwise the result might be unsatisfactory and end in nothing. I have strong hopes if this were done it might materially help to decide the claims of many doubtful birds to rank as distinct species.

JOHN CORDEAUX.

Great Cotes, Ulceby, Lincolnshire,
February 1, 1869.

Rough Notes from the Channel Islands.

By JOHN A. HARVIE BROWN, Esq.

JANUARY 26. On Saturday last, whilst driving over towards Cobo Bay, on the west side of the island of Guernsey, a fine large peregrine falcon flew close overhead. As the peregrine is a rare bird in the Channel Islands, I am inclined to believe that this bird must have followed the flight of woodcocks which I spoke of in my last letter (Zool. S. S. 1560). To-day I went over to the island of Herm, accompanied by my mother. * * * During a stay of about a week there, I managed to collect a good many species of shells, the proper names of which, however, I do not yet know. One large shell, of an ear-shape, is here called the "Ormer shell" (*query*, is "Ormer" a corruption of the French "Oreille"?), and is found at low-tide adhering in considerable numbers to the under sides of the loose granite boulders on the coast around Herm: the fish is excellent eating when carefully cooked, and is of much the same flavour, firmness and consistency—after being well hammered with a mallet—as a well-done veal-cutlet. Another species of shell is only procurable at extremely low tides, and in one little bay at the back of the island: I only obtained a few specimens, as the day was cold, and upon cold days the fishermen tell me they are not so easily found: they are small bivalve shells, beautifully marked with purple and green, and having often two bright pink or dark purple spots on either side of the hinge: they are obtained, like most other living bivalves, by searching for the little round holes in the wet sand, which indicates their whereabouts, and by digging quickly beneath to the depth of a foot or more. But, as regards shells, perhaps the most wonderful peculiarity of Herm is the shell-beds at the north and north-east end of the island: here the tide often rises forty feet, and occasionally as high as forty-five feet: at low-tide great floors of rugged rocks are left uncovered, with bits of sandy shore showing here and there, and altogether presenting unveiled one of the most dangerous-looking coasts I ever saw anywhere: at one point especially do the shells seem to have been accumulated by the tides and current in immense numbers: cartloads are taken away at times to be burnt into lime: they are for the most part very minute, and many of them are very beautiful; so minute, indeed, are many of them that it is almost impossible to pick them up, except by means of a pair of forceps or the tip of a tea-spoon; and this also the more especially if the day be such a one as the first, on which I lay on the north-east bank, shivering and teeth-chattering, in a cold east wind. How many species I have collected I cannot say at present, as they are all carefully packed up in little boxes of cotton. Perhaps the two commonest and most delicate-looking species are little pink-tipped conical and minute pink spiral shells: the latter can be obtained in any numbers in one little bay at the back of Herm.

Whilst lying on the north-east bank one day I was startled by the loud noise made by a flock of oystercatchers on the rocks, and looking up observed a flock of these birds, of whose numbers I could form no conception: nowhere have I ever seen such immense numbers as I to-day beheld: they were crowding on to a particular point of rock to such an extent that a great many of them could not obtain standing room: at least I should think one-third of the whole were continually hovering and alighting again, quite unable to obtain a foothold without displacing their companions: a perpetual piping was all this time kept up by the birds, though at the distance, and from the number of the birds, it sounded in my ears merely as a loud and confused "hum": it is worthy of notice also that during the rest of my stay on the island, though the tides left the rocks in a very similar state, I never again observed anything like the number seen on that particular day, although the numbers of the other species seemed in no way diminished.

I watched through my glass a nice flock of forty curlews wading sometimes knee-deep and thrusting their long bills deep amongst the green slimy-looking sea-weeds. Also saw large flocks of ringed plovers, amongst which I could easily distinguish numerous individuals of the Kentish plover: these two species seem to feed together, but always to separate when on wing. I also observed a solitary knot far out on the shore, and a couple of herons fishing in the rock-pools at least four hundred yards from the main island: their heads only were visible, as they occasionally stretched their necks and peeped over an intervening sand-bank, but as the sun was shining right on them, as I swept the rocks with my glass,* I easily noticed them. A fine flock of Brent geese pitched in the water about three hundred yards from where I was seated: some winters these birds are very abundant round Herm. At the north-east point of Herm the tide runs past at a tremendous pace,† forming a stream about sixty yards wide between the main island and the outlying rocks. I was seated close to the edge of this torrent, when a pair of redthroated divers, all unaware of my presence, came floating swiftly past with the current, within ten yards of the shore: I had a quick but clear view of them for a minute or so, but they were soon swept past a projecting rock out of sight: another day, at the same spot, I had another opportunity of observing them in precisely the same manner. A few razorbills and one guillemot also drifted past me. All this time the oystercatchers on the far-out reef were piping and fluttering, and perhaps fighting for foothold; but now, as the tide rose, these clamorous birds began to disperse; little bands of six or eight splitting away from the main body and flying away westward along the shore. When the tide was nearly full the ringed plovers and the Kentish plovers—always keeping separate from one another—flew piping across the shell-bank, and whirled down again to the beach on the other side: had I had a gun, and been so inclined, I could have obtained abundance of specimens—indeed have made a valuable addition to our larder, which was in no ways over abundantly supplied.

January 28. To-day I walked round the island examining the coast scenery: this was well worth seeing, but rather tame and disappointing after such rock scenery as the West of Scotland presents.

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* I cannot too strongly recommend Mr. Steward's "Lord Bury Telescope" to the ornithologist: it is a beautiful glass.

† I have heard it stated to be often at the rate of thirteen miles per hour, but whether correctly so stated I cannot take upon myself to say.

A little cave not half a mile south of the landing-place is well worth a visit, especially to the botanist who wishes to see that beautiful fern, Asplenium marinum, growing in perfection: the cave is only about twenty feet in length and three or four feet wide, but a person can easily walk in to the very back of the cave; right to the back, and covering the whole roof and sides, grows the Asplenium marinum, of good size and wonderful freshness. At the back or south-eastern side of the island is a fine creux, or funnel-shaped opening in the top of the cliff, communicating beneath with the sea, which dashes through a lateral opening at high tide; but fine as this creux is said to be, it is but a pigmy compared with the one of a similar nature at the back of Handa, in West Sutherland. Here, in Herm, the sides of the creux are some eighty feet high at the most, whereas those of the one at Handa, being quite as high as the outside and surrounding wall of cliff, must be at least three hundred feet, and I think I understate their altitude at that figure. Moreover, the walls of the creux here are not nearly perpendicular, and it would be no hard matter to descend from top to bottom or *vice versa*, but at Handa such would be simply impossible, unless a fifty-fathom rope were used, as the walls are quite perpendicular, and indeed in some places the top overhangs the base.

During my walk round the island I saw a fine covey of partridges and also two couple of birds already paired: these have been introduced to the island by the present proprietor, and he intends, I believe, also to try and stock his island with pheasants. I met the gamekeeper to-day busy amongst the rabbits: he told me that a large eagle had for some time been flying about Herm, but some two days back had taken a strychnined bait which he had laid for it, and had not since been seen: he felt sure it was lying dead somewhere; and accordingly on the following Sunday (January 31st) one of the labourers picked up the bird amongst the rocks of the south end of Herm, and brought it into the inn, where I had an opportunity of examining it: it had just begun to decompose, the eyes being much sunk; the neck and legs were quite supple, showing that "by poison he died;" it was a male bird of the year and in good plumage, though the tail-feathers were rather soiled and rubbed at the tips: the keeper had called it a "golden eagle," but it was only a whitetailed. In all probability this bird was mated with the other eagle which was obtained on Herm about three or four months ago, also by the gamekeeper and by the same means, and I think taken notice of at the time in 'Land and Water:' these two birds, male and female, are now at Mr. Couche's, birdstuffer here, the one stuffed and the other to be stuffed for the gentleman who owns the island.

Herm swarms with rabbits and with rats: of the former I heard that five thousand had been sent off during last season. The island only contains about seven hundred acres altogether, and only a small portion in the centre is cultivated. The rats I am told, however, are even more destructive than the rabbits, and a whole field of wheat has been destroyed principally by them: little heaps of half a dozen or more dead ones are to be seen every here and there, showing the able workmanship of the keeper and his steel-traps and strychnine. Mr. Purday, the landlord of the little inn here, and a capital seaman, &c., informed me that occasionally the rats have been found, at low tide, drowned, with the tip of their nose or tongue held fast between the edges of the limpet-shells and the rock, thus having paid penalty for their curiosity. About this period we had extremely rough weather and high tides, and Purday, who crosses every day to Guernsey, weather permitting, could not put to sea. The crossing is only about three miles, but nearly half way across from Herm to Guernsey a great field of sunken rocks stretch out, and these, together with the cross-tides and an otherwise stormy sea as well, make the crossing in rough weather dangerous even to those accustomed to the coast. During the days these gales lasted, Purday, who is quite "well up in shells" assisted me in my excursions at low tide, and, as he knew all the localities, greatly helped in swelling the number of my specimens: he also procured for my mother various sea anemones, hairy urchins and other sea wonders, to be painted. One anemone was apparently very common here: the name I found out is "Peachii," whether they are common elsewhere or not I do not know, but I have never observed them myself on any former occasion. We also got a worm dug out of the sand, which I was told was very rare; I forget the name, but perhaps some of your readers might recognize it from the fact that under the microscope the filament or skin presents to view a great number of little sack-looking vesicles exactly the shape of a ship's anchor.

I hope to go to Serk soon, and if there be any notes worth sending I shall forward them to you after my return from that island.

John A. Harvie Brown.

St. Peter Port, Guernsey,
February 8, 1869.

Collected Observations on British Reptiles.

By EDWARD NEWMAN.

THE number of reptiles inhabiting Britain is so small that it is difficult, if not impossible, to give any satisfactory idea of their affinities or of the general characters of the class to which they belong, unless we emancipate ourselves entirely from the geographical restrictions which these small islands impose on us, and regard both the class of reptiles and its various divisions as they are ascertained to exist on the whole surface of the habitable globe. We learn from the records of travellers, verified by specimens in museums, that some seas are teeming with turtles, some rivers with crocodiles, some forests with huge boas, and some sandy deserts with lizards of every different structure. And we learn from the testimony of the eternal rocks that at some remote period huge reptiles peopled the earth to the exclusion of man, of sucklers and of birds. We must not, then, ignore either the past or the present prevalence of reptile forms, but must consider the class synthetically as a whole, analytically only as known in the small islands we chance to inhabit.

Reptiles constitute the third primary division of endosteate animals, and are distinguished from the members of the other three by the total absence of any deciduous covering of the skin. It has often struck me as remarkable that neither Linneus, Cuvier, De Blainville, Geoffroy St. Hilaire, nor Duméril and Bibron have noticed the simple and obvious external distinguishing character of reptiles. The epidermis, or outer skin, of quadrupeds is clothed with hair, of birds with feathers, of fishes with scales, but in reptiles it is uncovered, perfectly naked. It is not extraordinary that our natural-history book-makers, having no practical knowledge of the subject, should have overlooked so vital an omission, but it is extraordinary that the men whose names I have enumerated above, each one of whom thought for himself, failed to observe so important a diagnostic. When, in 1856, I published my little treatise on the 'Physiological Classification of Animals,' I had no idea that the distinguishing external or structural peculiarity of reptiles remained unnoticed. This omission is not simply such: it is accompanied by many positive errors; thus Merrem and others have a reptilian order Squamata, and Cuvier repeatedly uses the word *écailles* in describing the covering of snakes and lizards. The processes in question, whether described as *squamæ* or *écailles*, are projections, folds or rugosities of the under skin, and are not deciduous, like hairs, feathers and scales, but are as permanent and durable as the bones themselves. This may be seen when the slough of a snake is found. This slough is continuous, and contains a faithful mould of each of these processes: it is a very beautiful and very instructive object. The tortoise exhibits the peculiarity of an *articulated skin*, the articulation being clearly discernible in the living animal, but becoming more conspicuous after death; when dehiscence takes place, and the plates fall off, perfectly detached from each other.

Reptiles are further distinguished from sucklers and birds by their generally colder blood, and from fishes by the possession of a neck susceptible of being bent at an angle with the body; by the absence of a lateral line; and by their mode of breathing, reptiles in their perfect state breathing by nostrils and lungs, fishes by the mouth and gills. Fishes, moreover, breathe water, or rather the air contained in water, reptiles breathing the atmospheric air. The breathing of fishes is rythmical, that of reptiles irregular and capable of long suspension.

Reptiles have a less equable temperature than sucklers or birds, the heat of their bodies being more under the influence of atmospheric changes. Nature secures the well-being of the bird by providing it with a thick clothing of feathers which maintain some degree of uniformity in the temperature of the body; but the reptile is preserved by a different arrangement, the temperature of its body rises and falls with that of the surrounding medium. Thus reptiles are rarely seen abroad in cold weather or in cold countries: their languid circulation does not enable them to resist the increased cold, and very many, on the approach of winter, bury themselves in sand, gravel or mud, or conceal themselves in the hollow of trees or under fallen leaves, and become apparently lifeless.

Compared with sucklers and birds, all reptiles seem apathetic as regards their young; that fierce care which is the characteristic of both those classes has few examples among reptiles; and this is one of those natural rules which seem proved rather than invalidated by the occasional exceptions: thus when we hear of a python incubating her eggs, or a toad carrying her little ones in the cavities of her back, we say at once, "How extraordinary! what a striking exception to the rule." In this, as in every investigation, we must take facts as we find them, and never presume to define what ought to be the course pursued by Nature in her infinitely various arrangements for the perpetuation of her creatures.

It is the character of all endosteate animals to be what is called tetrapod or quadruped—that is, either to have four legs or some of the bones required for four legs, even if applied to a different purpose, which is very frequently the case: thus in man the fore legs are converted into arms; in bats and birds into wings; in snakes they are mere useless rudimentary appendages scarcely protruding beyond the scales; and in fishes they are changed into fins. In the group which I have called Saurians are many snake-like animals, such, for instance, as the blind-worm, which are without external legs, and this has led naturalists to regard them as snakes; but we must not adopt this view: indeed Nature will assert her prerogative, and show us clearly, from time to time, that we are in error in all our artificial combinations; thus the blind-worm, whenever it is frightened, irritated or annoyed, will assert its saurian affinities by throwing off its tail, a feat which no snake has the power or the propensity to perform.

Reptiles are divided into two subclasses: first, *immutable reptiles*, which after issuing from the egg undergo no change of form or character; and secondly, *metamorphotic reptiles*, which first appear under a fish-like form, breathing water, and finally assume a reptilian form, breathing air;* together with these changes, and necessarily in connexion with them, they undergo a complete metamorphosis of internal structure. The immutable reptiles invariably have a harsh and dry dermal envelope, covered with inequalities called plates, crests, scutes and scales; while that of the metamorphotic reptiles is generally moist, often having what is called a mucous surface.

Subclass 1. IMMUTABLE REPTILES,

Are divided into four orders, commonly known as Tortoises, Crocodiles, Lizards and Snakes.

Order I. TORTOISES (CHELONIA),

Which have no teeth, but a bird-like beak comprised of two corneous mandibles, and in which the vertebral column, the ribs and sternum are greatly dilated, and all their edges soldered or anchylozed together, forming a complete box, in which the animal may be said to reside, as a snail in its shell, and from which it protrudes its head, legs and tail: in some genera the head and fore legs can be protruded, at the will of the animal, through an anterior, the tail and hind legs through a posterior, opening; but in other genera the head and legs are always protruded and cannot be withdrawn. The bony case or shell is covered and inclosed by an indurated articulated skin, well known in some species under the name of tortoiseshell.

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* See the recently published paper (S. S. 1529).

No species of this order now occurs in England or its seas. Formerly a species, still sufficiently abundant on the Continent, Emys lutaria, appears to have inhabited the broads of Norfolk, and recently a single example of the same species has once been found alive in an English canal. I therefore think it desirable to cite the description from Lord Clermont's most admirable work on the quadrupeds and reptiles of Europe, and also the two passages which refer to the subject as regards Britain.

FRESHWATER TORTOISE, *Emys lutaria.*

"Carapace wide, oval, more or less depressed; black, marked with yellow spots, varying in distance from each other, but arranged like rays, extending from the centres of the plates to their circumferences; the neck-plate is small; the plastron is attached to the carapace by a cartilage, and is movable before and behind; the tail is rather long, rounded and ending in a point; it is always shorter and thicker at its base in the males than in the females. Entire length from 9 to 11 inches. Lives in lakes and marshes, remaining generally buried in the mud: as winter approaches it comes to land, and passes that season in a state of torpor, hidden in some hole. The female lays her eggs in a dry place, but close to the water; they are white, marbled with ash-gray. This tortoise is widely spread over Europe, being found in Greece, Italy and its islands, the South of France, Hungary, Germany as far north as Prussia, the Crimea and shores of the Caspian Sea. In most of these countries the flesh is eaten (though not much esteemed) by the natives."—*Lord Clermont.*

This extremely pretty little tortoise is brought over from the Continent in hundreds, and often offered for sale in the streets of London at a very low price. It is very hardy, living in any tank or pond without any care, and not uncommonly surviving several successive winters; but I am not aware of any instance of its having produced young in the localities where turned out: it is too small, and too fond of concealing itself, to be a very desirable introduction, otherwise I imagine it might be naturalized with very little trouble. I now copy the evidence of occurrence in Britain, which of course is not to be taken as establishing its claim to rank as a British species.

"Some weeks since, when examining the large collection of animal remains in Mr. Birch's possession, all of which were, I believe, found on his estate in Norfolk, I found, to my surprise, some specimens far more interesting than any I had expected to meet with. They consist of some limb-bones and a considerable portion of the dorsal and sternal shields of two individuals of the European fresh-water tortoise (*Emys lutaria*), a species the existence of which at any time in the British islands has never before been suspected. These were found, as a label upon them in Mr. Birch's handwriting testifies, so long ago as June, 1836, in a peat-bog, by the side of a spring-pit, at East Wretham, about seven feet below the surface, and beneath some fifteen hundred laminations of a species of Hypnum, specimens of which were, I understand, submitted by Mr. Birch to Sir William Hooker, who declared the species to be Hypnum filicinum. I immediately communicated these facts to Professor Owen and Professor Bell, as being respectively the highest authorities on the fossil and recent reptiles of this country; and subsequently sent the remains to the first-named gentleman, who kindly determined the species for me, thereby confirming the view I had taken of them, but adding that they were somewhat larger than modern examples from Germany, now in the British Museum."—*Professor Alfred Newton, in Zool.* 8189.

"I was exceedingly startled to read, in the last number of the 'Zoologist' (Zool. 8190) an extract from Mr. Newton's essay 'On the Zoology of Ancient Europe,' in which he says the remains of a fresh-water tortoise have been discovered in recent peat in Norfolk. The following has been in print some months in a Supplement prepared by myself to a forthcoming work, by Sir Oswald Mosley, on the Zoology of this district:—'Cistudo europæa, *Cuv.* (The Spotted Marsh Tortoise). This species is introduced owing to an example having been captured, in the early part of the summer of 1857, on the banks of the canal near Burton. It is not a species that can be kept long in captivity; but it is probable it may have lived for a long period in the canal, or even have bred there, if accident had provided it with a mate. This animal is said not to take food excepting in the water. The individual in question died very soon after coming into my possession.' When I penned the above remarks I had no other idea than that my specimen, improbable though the supposition was, had been kept in an aquarium, and had escaped accidentally from captivity. With the evidence, however, adduced by Mr. Newton of the recent occupancy of this country by a fresh-water tortoise, it appears to me to be the less improbable supposition to view my specimen as a truly British-born and indigenous individual. The names Cistudo europæa and Emys lutaria are treated as synonyms by some authors, but even should not that be quite correct, it is very probable a mistake may have been committed in naming the imperfect Norfolk remains Emys lutaria of Gray. The spotted fresh-water tortoise lives in lakes and marshes, some of which are situated in the extreme south of Europe, others as far north as Prussia, and it is said to bury itself in the mud during the greater part of the summer, and to hide in some hole on land in winter."—*Edwin Brown, in Zool.* 8238.

EDWARD NEWMAN.

(To be continued.)

Otter in Suffolk.—A fine male otter, weighing twenty-five pounds, was shot on the 20th of January at Halesworth: it passed into my hands for preservation.—*T. E. Gunn; 21, Regent Street, Norwich.*

Peregrine Falcon in Kent.—On the 18th of October I saw a large peregrine falcon flying over Cobham Park. Mr. Power records seeing one on the 1st of October, which might have been the same. I have been much pleased to see so many communications to the 'Zoologist' from Kentish naturalists, *viz.*, Messrs. Power, Hunter and Skinner. It is very interesting to compare my notes with theirs, as sometimes, as in this case, we seem almost to be speaking of the same bird, for Faversham is within twelve or fifteen miles of Cobham.—*Clifton; Eton, February* 1, 1869.

Peregrine Falcon near Brighton.—Another male was shot, on the 11th of February, near Rottingdean, by Mr. G. R. Guthrie: this, with the male of the 9th of November, makes the sixth obtained by that gentlemam.—*T. W. Wonfor; Hon. Sec. Brighton and Sussex Nat. Hist. Society.*

Lesser Kestrel near York.—Some time since the editor requested Mr. Newton to investigate a lesser kestrel said to have been obtained at Cambridge, and it turned out to be only the common species. Mr. Allis, however, informs me that a real one has been shot by a gentleman farmer near York and presented to the Museum.—*J. H. Gurney, jun.*

The Black Kite at Alnwick.—I am not aware that Mr. Hancock's black kite has been noted in the 'Zoologist.' It was trapped in the red-deer park at Alnwick, by a keeper who thought it was a "moor buzzard," and it came up to Newcastle, in the flesh, to Mr. Bates, a birdstuffer, on the 11th of May, 1866. It was rather bloody, therefore Mr. Hancock simply skinned it. Sir Robert Sibbald speaks of the "black gled" as a former inhabitant of Scotland.—*Id.*

Roughlegged Buzzards in Norfolk.—On the 2nd of December, 1868, a male was obtained at Mannington: weight two pounds and a half. A second bird, also a male (immature), was shot at Rollesby, on the 27th of January last. I preserved both specimens.—*T. E. Gunn.*

Gray Wagtail and Pied Flycatcher in Kent.—Mr. Power, in the 'Zoologist' for January, says that the gray wagtail appeared on Rainham Marshes on the 8th of September: on that very day I saw one at Cobham, the only one I ever saw there: I did not see it again. On the 17th of September I was attracted by a small bird, looking like a miniature hen chaffinch, flitting about the branches of an oak: after some observation I perceived that it was a pied flycatcher in the brown and white plumage.—*Clifton.*

Early Nesting of the Thrush—I have to record two instances of the early breeding of the song thrush in Norfolk this season. A little boy named Cooke found a nest of five healthy young ones on the Eccles Hall Estate, on the 13th of January. On the 2nd of February a nest of young, fledged, were discovered in the fernery at Egmere House, near Wells.—*T. E. Gunn.*

Piebald Variety of the Blackbird.—A well-marked piebald variety (a female) of the blackbird was shot here a short time since. A singular fact connected with this variety has just attracted my notice, *i. e.* the female of this species is much less subject to variation than the male; for instance, out of every five pied blackbirds only one is a female—at least such is my experience in this neighbourhood. Perhaps that of observers in other districts may differ.—*Id.*

Dartford Warbler at Lyme Regis.—On the 14th of December, 1868, Mr. Gatcombe sent me a Dartford warbler, in the flesh, from Lyme Regis.—*J. H. Gurney, jun.*

White Sky Lark in Confinement.—Our local newspapers contained an account of a white sky lark being captured early last year, at Melton, in Suffolk: it was a fine young male bird and promises to make a first-rate songster. It is now (October, 1868) in the possession of Mr. Heffier, of Woodbridge.—*T. E. Gunn.*

Calandra Lark near Exeter.—In Newman's reprint of Montagu's Dictionary I observe the Calandra lark is introduced into the British list for the first time, on the authority of my friend Mr. Gatcombe. It may be of interest to know that Mr. Gatcombe has seen another in the possession of Mr. Byne, which that gentleman had got from Truscott, the Exeter birdstuffer, who said it was "a Lapland bunting," and killed near Exeter.—*J. H. Gurney, jun.*

Young Sparrows in December.—Yesterday (December 16), while out walking, I saw a young bird on the ground just before me, and gave chase. I caught it, and found it was a young sparrow just out of the nest, and not yet able to fly well. This seems to me so unusual an occurrence that I thought it would interest you. I noticed, too, another very rare event for this season. Last Sunday, whilst in church, a beautifully marked peacock-butterfly was crawling on the window-seat by my pew, fully developed. This I had noticed the Sunday before, near the same place, but not seemingly in so forward and lively a condition. Surely both instances mark the very mild weather we have had. At Southampton a nightingale was heard singing on the 7th of this month, not in a cage, but in a fence by the side of the road.—'*Land and Water.*'

Tree Sparrow and Blackheaded Bunting in Kent.—A large flock of tree sparrows frequented a small wood at Cobham this winter; and on the 6th of January I saw a blackheaded bunting, at some distance from any water.—*Clifton.*

Goldfinch, Mealy Redpole and Lesser Redpole in Kent.—During December and January I saw, at different times, four goldfinches, one mealy redpole and about twenty lesser redpoles, all in the same vicinity—some large ponds fringed with alder-tree, at Cobham.—*Clifton.*

Chocolate Variety of the Common Starling.—On the 13th of January a beautiful variety of the starling was shot at Horstead, and forwarded to me for preservation: it is an adult female, its plumage being of a pale chocolate on its head, neck and breast, the latter much paler, and the former tinted with purple reflections; the back of a pale reddish yellow, the feathers tipped or edged with darker colour; wings and tail white, some of the feathers of a pale reddish yellow, and others only edged with the same tint; eyes, bill and legs much paler than in ordinary specimens.—*T. E. Gunn.*

Extraordinary Migration of Pigeons.—On Thursday morning, a most wonderful host of pigeons passed over this district at daylight. The birds were first observed flying high in the air from north to south. I do not exaggerate when I say that millions must have passed between daylight and eleven o'clock. At one time they were so numerous as to seem like a dark cloud passing athwart the sky. Can these be wood pigeons in such astounding numbers? Such they certainly seemed to be; and if they are not cushats, what are they? There can be no doubt as to their being pigeons of some kind.—*From the 'Field.'*

Extraordinary Migration of Pigeons.—Referring to the migration of pigeons noticed by your correspondent from Barnet, I had seen them near here for about a week before the day mentioned by him. They came over my house three or four times, and I should say the flock must have been at least a mile long, and there could not have been less than 8000 or 10,000 of them. There is no doubt that they were common wood pigeons, as one morning about 500 out of the flock settled on some trees close by the house, and I had a good opportunity of seeing them. I have never seen them since the day named by your correspondent; and as a friend of mine at Tottenham, and another at Sydenham, also observed them about the same time, I have no doubt that they left the neighbourhood. I hoped to have heard of them again in your last impression, and write this in the hope that we may hear where they have gone to.—*Evelyn Fairlie; Elm Lodge, Cheshunt, Herts, January* 11, 1869.—*Id.*

Offer of Parasites from the Gold Pheasant.—Having some parasites from the above-named bird I shall be most happy to distribute specimens on receipt of stamped address.—*T. E. Gunn.*

Pheasant containing Egg in January.—Having received a hamper of game from Devonshire on Saturday, my servant in trussing a hen pheasant found a nearly full-formed egg within. This appears to me a very unusual occurrence at this season of the year.—*Joshua Jeffery;* 15, *Newcastle Street, Strand, January* 12, 1878.—*From the 'Field.'*

Partridges Nesting in January.—I think it worth while to mention that a partridge's nest of eight eggs, nearly hatched, was found a few days ago in a field on the glebe land of King's-Nympton, North Devon, by a farm labourer.—*Henry Byne; Miligan Hall, Bishop's Hull, Taunton, January* 9, 1869.—*Id.*

Partridge containing Egg in Winter.—Some game arrived here on the 17th of December, from a friend who resides near Congleton, in Cheshire. One of the partridges, on being opened, was found to contain an egg fully formed. It is now in my possession. The bird was, I believe, shot on the 15th of December, and was in good condition.—*F. Arber; 40, Upper George Street, Bryanston Square, W.*—[Although the partridge is generally considered to be very regular in its breeding habits, we have known of several instances of its laying at this season of the year. In 1863 a perfect egg was sent us from Norfolk, taken from a partridge killed on January 4. A few weeks later a correspondent sent us an account of a nest found near Gloucester, which contained three partridges' eggs. And in the 'Field' of February 8, 1868, Mr. Lloyd records the fact of a young partridge being seen on February 4, in the act of clearing itself from the shell, while three other eggs remained in the nest; so that these eggs must have been laid very early in January. As a rule partridges do not begin to lay till the end of April or the beginning of May, and, having laid their full complement of eggs, begin to set about the last week in May.—*Ed. of 'Field.'*]

Creamcoloured Moor Hen.—A very interesting specimen of a creamcoloured moor hen was recently caught at Russell Farm, near Watford, Herts, by Mr. W. F. M. Copeland, who has had it preserved in a case with one of the ordinary black colour, so that the difference of plumage is strongly shown. Mr. Copeland has kindly deposited the birds at our office, where they may be seen by any one interested in these singular variations.—*'Field' Newspaper.*

On the Variation in Colour of the Axillary Plume of the Golden Plover. By JOHN CORDEAUX, Esq.

IN the February number of the 'Zoologist' (S. S. 1544) I remarked that the colour of the axillary plume of the golden plover is not always uniformly white, but is occasionally more or less edged and broken with smoke-gray. In consequence of this remark, I have since received, from Mr. J. E. Harting, an interesting communication on this subject, which, with his permission, I now copy for the benefit of the readers of the 'Zoologist.' I trust that other naturalists will examine the question, and communicate the result of their observations.

Mr. Harting writes as follows:—

"There are said to be four species of golden plover, namely, the European (*Charadrius pluvialis*), which has also been found in Africa;* the Asiatic (*C. longipes*); the American (*C. virginicus*); and the Australian (*C. orientalis*), which is probably the bird found in Japan.†

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* Hartl., Orn. W. Africa, p. 215.

† Temm. & Schleg., Faun. Jap., p. 104.

"I have great doubts as to the three last being specifically distinct. They all have the axillary plume smoke-gray (instead of white, as in C. pluvialis), and, except in point of measurement, this is the only respect in which they appear to differ from the European bird.

"Between themselves, as it seems to me from a comparison of several skins, they differ only in the relative proportions of bill and tarsus: the slight variations in size and colour (especially of the tail-feathers) being attributable to the age of the individuals, and to the seasons at which each is obtained.

"No one of the three, C. longipes, C. virginicus or C. orientalis, has as yet been recorded as visiting the British islands. Your observations, therefore, at once give rise to the question, Does the golden plover found in Lincolnshire, with the axillary gray, or partly gray, belong to one of the three species just named, or is it merely a variety of C. pluvialis, showing that the colour of the axillary plume is not constant, and therefore of no specific value?

"Should it be proved that the colour of the axillary plume in C. pluvialis is often variable, as suggested, then I should be inclined to say that the characters upon which the four species of golden plover have been founded, are really insufficient to constitute them distinct, and that there is but one species after all, whose geographical range, like that of the gray plover (*Squatarola helvetica*), is world-wide, so far as is known."

From these remarks it will be gathered that an important question is raised on the difference between "species" and "variety."

JOHN CORDEAUX.

Great Cotes, Ulceby, Lincolnshire.

A Buffcoloured Woodcock.—About a fortnight ago I shot in Galway, in the wood of Garryland, about two miles from Gort, a buffcoloured woodcock. The bird had the same marks and was of the same size as the ordinary bird, but his plumage was in different shades of light buff instead of brown. I have sent him to a birdstuffer in Dublin to be set up.—*Robert B. Templer; Loughgall, Co. Armagh, December* 26, 1868.—*From the 'Field.'*

Black Swan, &c., on the Solent.—I have for preservation the following birds, shot on the Solent waters:—Black swan shot in September last; great crested grebe, in December; a great blackbacked gull and a male pintail duck in January, 1869. Wild fowl have been scarce this winter, owing to the mildness of the weather.—*John Wright; Lymington, February* 17, 1869.

Parasitical Worms in the Stomach of a Redbreasted Merganser.—I purchased an immature male of this species on the 7th of December last, and in dissecting it I found in the entrance to its stomach some worms thirty in number, and apparently of the same species as those I have previously mentioned in the 'Zoologist' as having been taken from the cormorant. I have them in spirits.—*T. E. Gunn.*

Great Crested Grebe at Hempstead, in Norfolk.—A great crested grebe was shot at Hempstead, in Norfolk, on the 8th of November, and another (which I saw in the flesh) on the 28th at Grantham, in this county.—*J. H. Gurney, jun.*

Great Auks for Sale.—Prof. Newton informs me that Frank, the dealer, at Amsterdam (Vijzelstraat, B. B. 619) has a great auk, for which he is *only* asking £125. Herr Wilhelm Schlüter, No. 17, Halle a S., Prussia, has another for sale. I learn from my father that a skin from Coventry is likely to be sold in London shortly; and I know of a fourth example in private hands to be disposed of—an average specimen, in full summer plumage. It must be some time since so many have been in the market.—*Id.*

Little Gulls in Sussex.—In the February number of the 'Zoologist' I mentioned that several of these birds had been taken near Brighton. I now find nine specimens have been obtained in this county: one at Hastings, two at Eastbourne and six at or near Brighton. At Eastbourne seven were seen and one was obtained: they disappeared for a few days and then only four were seen together: one of these was shot, after which the remaining three took their departure; all the specimens obtained were young birds. Query, were they all the same flock?—*T. W. Wonfor.*

Voracity of the Common Gull.—On the 27th of January, in dissecting a specimen of the common gull, I found a young water vole, almost entire (about half the tail only being gone) in its stomach, the head being swallowed foremost. It measured five inches in length.—*T. E. Gunn.*

Food of the Fulmar.—As corroborating a note of mine on the food of the fulmar (Zool. S. S. 1483), I may mention that Dr. Saxby has also found the jaws of cuttlefish in the stomach of this species.—*J. H. Gurney, jun.*

Early Birds' Nests.—During the last week in January a gentleman, near Maidstone, found two nests, one a blackbird's, the other a thrush's—one with young, the other with eggs. A gentleman also brought into the market a pea-stalk with blossoms and a few just in pod.—*David John French.*

The Crow Blackbird a Robber.—Three years ago this spring there came into our village a flock of a dozen or more of the common crow blackbird (which are plenty in the country above here), for the purpose of building their nests in the tall Lombardy poplars in our streets, and they have been with us each season since, leaving whenever the young can fly. Until this season they have made their nests only in the poplars, selecting places near the trunk, where the clusters of nearly upright limbs secure them from ordinary observation. This spring they have appeared in greater numbers: two pairs have built their nests inside the spire of a church, passing through the openings of an ornamented window high up above the tops of our tallest trees. A bell is in the tower of the steeple below, and is rung at customary times, and a colony of doves is in the section near the bell. The writer has just discovered that the blackbirds have taken possession of a martin-house in his garden: they are busily engaged carrying in materials for nests, and the martins are flying helplessly about. Also, in the top of the pyramidal trellis covered with vines, forming the lower half of the support of the martin-house, a pair are building: it is a place used some years ago by robins; but the fact was so novel that, instead of driving them off, a new martin-house is to be put up at once near by, which the martins, in their necessity, will no doubt occupy. The blackbirds are tame about our streets and gardens, alighting on the ground at the same time with the robins, with much the same habits in this respect, although evidently going beyond the limits of the village for most of their food. We have robins in large numbers,—small birds being protected by law,—and on the arrival of the blackbirds the *first* season there was trouble among them, and their note, denoting disturbance, could be heard on every side; and for good reason, for the blackbirds, without so much as saying "by your leave," took the materials from every unfinished or unoccupied robin's nest they could find; but, singularly enough, the blackbirds soon succumbed, and the robins drove them away in all cases of contest; but they seem to live in harmony, and, as I have mentioned, are often in company on the ground seeking for food.—*Newark (New York) Correspondent in the 'American Naturalist,' August*, 1868.

The Robin at Fault.—A remarkable instance of the lack of the "bump of locality" in birds came under my observation some years ago. I had nailed a board of moderate width under the eaves of a barn to form a resting-place for the nests of the cliff or jug swallow: it was inclined at an angle, so as to form a sort of trough. A robin commenced building her nest in it; but, seeming unable to fix upon any particular spot, deposited the mud and straw along the entire length of the trough, about ten feet: after working several days she abandoned her task. Shortly afterwards I saw a robin (whether the same bird or not I cannot say) attempting to build her nest in the same way, along the entire outer cornice of a house, about thirty feet.—*'American Naturalist,' June*, 1868.

Galatea Andrewsii at Penzance.—I have to record the occurrence here, in seven fathoms water on sand, of Galatea Andrewsii of Kinahan. My specimen is a female, nearly full grown, and was kindly identified for me by Mr. Spence Bate. The specimen was taken by me in August last.—*Thomas Cornish; Penzance, February* 6, 1869.

The Locust Killer.—I never saw but one of these wasps, and that was about two years ago, and then only for a few moments: it appeared to be marked almost, if not precisely, like a hornet, and to be about two or two and a half inches in length, and large in proportion; truly a most formidable-looking insect. The "killer" had seized one of our August locusts, and was endeavouring to rise from the ground with it, the locust clinging to the grass, and fluttering and screaming [? *E. N.*] all the while. Before I could seize them they rose from the ground and made off in a bee-line, at a height of about twelve or fifteen feet, the locust resisting with might and main. I am told they make nests in the ground, boring a hole to the depth of two or three feet. They must be rare, or I should have seen them before.—*C. W. Taylor; Hulmeville, Pa.* [The wasp is probably the Stizus speciosus, which seizes the Cicada to store its nest with, which is probably not more than a foot in depth.—*Editors of 'American Naturalist.'*]

PROCEEDINGS OF SOCIETIES.

ENTOMOLOGICAL SOCIETY.

February 1, 1869.—H. W. BATES, Esq., President, in the chair.

The President returned thanks for his re-election, and nominated as his Vice-Presidents Messrs. Pascoe, Frederick Smith, and A. R. Wallace.

Donations to the Library.

The following donations were announced, and thanks voted to the donors:—'Catalogue of Scientific Papers (1800—1863) compiled and published by the Royal Society of London,' Vol. ii.; 'Proceedings of the Royal Society,' Nos. 105 and 106; presented by the Society. 'Journal of the Linnean Society,' Zoology, No. 45; by the Society. 'Journal of the Quekett Microscopical Club,' Nos. 4 and 5; by the Club. 'Bulletin de la Société Impériale des Naturalistes de Moscou,' 1868, No. 1; by the Society. 'Genera des Coléoptères,' Tome viii.; by the Author, Prof. Lacordaire. 'Essai Monographique sur les Oxybelus du Bassin du Léman (Insectes Hymenoptères),' par Frédéric Chevrier; by the Author. Newman's 'British Moths,' No. 26: by the Author. 'The Zoologist,' for February; by the Editor. 'The Entomologist's Monthly Magazine,' for February; by the Editors.

Exhibitions, &c.

Mr. Edward Saunders exhibited a specimen of Pachetra leucophæa, captured by Mr. N. E. Brown, on a gas-lamp at the Redhill Railway Station, on the 14th May, 1868.

The Secretary read a letter from Dr. W. Webster Butterfield, of Indianapolis, offering to exchange Lepidoptera of Indiana, U.S.A., for those of England.

Mr. Pascoe made some observations on the Coleopterous genera Aprostoma, Mecedanum and Gempylodes, with reference to the remark of Prof. Westwood (Proc. Ent. Soc. 1868, p. l.) that these genera would probably have to be united. M. Guérin's genus Aprostoma was by Prof. Lacordaire referred to the family Brenthidæ; at all events the insect from the Niger exhibited by Prof. Westwood was generically distinct, and in Mr. Pascoe's opinion abundantly distinct, from Gempylodes.

Mr. Pascoe exhibited a curious bug (perhaps an Odontoscelis) from the neighbourhood of Toulon; he had been unable to identify it with any species described by M. Mulsant.

Prof. Westwood gave an account of the new vine-pest, Rhizaphis, to which his attention was first called in 1863: its mode of attacking the vine was two-fold, or at all events specimens between which he could not find any difference, and which to all appearance belonged to the same species, caused damage to the vines in two very different ways. Some of them sucked the upper side of the leaf, and caused the appearance on the lower side of a gall, which was unique in its character; the upper coat of the leaf split into tooth-like or radiating segments, each with delicate white filaments; beneath this covering the insect sheltered herself, being visible through the interstices between the radiations, and was of the size of an ordinary pin's head; there she lay her eggs, which hatched immediately, and the mother and young together filled the cavity or cell; the young, however, soon left her, and went to the younger parts of the plant, to commence depredations on their own account; a leaf would sometimes be covered with them. Prof. Westwood knew no other instance of an insect burying itself in this manner. The other mode of attack was by sucking the roots or rootlets underground, thereby causing decay and rottenness, and killing the vine; there was not any gall or swelling formed, but he had found the young ones with their parent on the roots. In the South of France whole vineyards had been destroyed; and the pest occurred in England, though whether or not introduced or imported with the vines he could not say. The female alone was known, no males having been detected. He should be glad to hear if any Member present was aware of any instance of the same insect attacking a plant both above and below ground in two such dissimilar ways.

Mr. Frederick Smith was able to mention an instance. The common Cynips aptera was well known to form clusters of galls on the fibrous roots of the oak; on one occasion he had found, in Bishop's Wood, Hampstead, on the stem of an oak tree, about a foot above the ground, a large lump which he could only compare to a number of barnacles fastened to the bole; he cut the lump off, took it home, and to his surprise bred therefrom between twenty and thirty specimens of Cynips aptera.

Mr. Charles Horne (who was present as a visitor) exhibited the stings of two scorpions which were killed by rats at Benares, on the 19th July, 1865; one of the stings shewed a large hole where it had been perforated by the tooth of the rat. The scorpion and rat were placed under a glass cover, and for some time the scorpion fenced about, tail over head, trying to get hold of the rat, but at a favourable moment the rat dodged down and made a rush at the scorpion, bit the sting through the middle, then placed its foot upon the scorpion, and began to pull off the legs at leisure. In India it was the constant habit of rats to destroy scorpions, and he believed they usually ate them; but in the case above described, the scorpion was not eaten by the rat.

Paper read.

The following paper was read:—"Description of a New Species of Hestina," by Mr. A. G. Butler. The species, Hestina Zella, from India, was described as being an excellent mimic of Danais Juventa, and most nearly allied to H. Mena of Moore.

February 15, 1869.—H. W. BATES, Esq., President, in the chair.

Election of Members.

Arthur Wynne Foot, Esq., M.D., of 21, Lower Pembroke Street, Dublin, was elected an Annual Subscriber.

Exhibitions, &c.

Prof. Westwood exhibited two parasites on bats from Ceylon, both Diptera, a Strebla and a Nycteribia, prepared for the microscope in Canada balsam. They were simply pressed between sheets of paper, an aperture having been made for the escape of the fluid matter, and whilst still moist were laid on the glass, and the balsam, heated over a spirit lamp and poured on hot, filled up the interstices and made the preparation transparent.

Mr. Butler exhibited a living locust of the genus Conocephalus: it had been received by Mr. Swanzy in London on the 2nd of February, and arrived on board a ship from the West coast of Africa. A swarm of them covered the decks, being at first green, but after about three days they became brown, probably from the absence of green food: notwithstanding exposure for some days to a very heavy sea, many specimens clung to the vessel and arrived in the Thames alive. The one exhibited had taken nothing since its arrival but a little water, except on one occasion when it was compelled to clean its face of some sugar which Mr. Butler placed on it.

Mr. F. Smith exhibited a collection of honey bees from all parts of the world, and solicited the loan of foreign species, the localities of which were known, to extend his knowledge of their geographical distribution and assist him in the preparation of a memoir on the honey bees supplementary to that published by him some few years ago in the ‚Annals and Magazine of Natural History': it was very desirable to obtain all the sexes of all the species, as the workers alone did not offer sufficiently marked characters to determine the identity or specific distinctness of many of the forms. Among the bees exhibited there were, a queen of Apis mellifica which was with difficulty to be distinguished from a worker; all the sexes of Apis Ligustica and fasciata (the latter, in the opinion of Dr. Gerstäcker was only a variety, but Mr. Smith thought he could show its distinctness); the male and worker of A. Indica, sent by Mr. Atkinson, of Calcutta; a queen, sent by Mr. Lewis from Japan, very closely resembling the common A. mellifica; specimens of A. nigrocincta (considered by Gerstäcker to be a variety of A. Indica); all the sexes of A. floralis, the smallest known honey bee (the worker of which is the A. lobata of Smith); A dorsata, the largest and commonest in India and the Eastern Archipelago (of which A. testacea was only a variety); and all the sexes of a bee from the Cape of Good Hope which might be only A. Ligustica, but was considerably larger. Mr. Smith also exhibited pieces of the comb of various species; the worker cells of the above-mentioned bee from the Cape were one-tenth smaller than those of A. mellifica, ten of the former being equal to nine of the latter; the cells of A. Indica were still smaller than those from the Cape; the combs of A. floralis, like those of A. dorsata, were attached to branches of trees; lastly, there were some cells of A. dorsata, made of the same material as the rest but an inch and a half in depth, which Mr. Smith supposed to be honey-cells.

Mr. Druce exhibited a collection of butterflies from Nicaragua, brought to this country by Mr. Thomas Belt. Amongst them was a new Papilio, near to P. Sesostris; and a series of Heliconiidæ representing four genera, but which looked like one species, the whole of them being found flying together. Ten or twelve new species had been obtained by Mr. Hewitson out of Mr. Belt's collection.

The President had obtained some handsome new species of Coleoptera, also from Mr. Belt, the scene of whose operations was the neighbourhood of the Chontales mines. Nicaragua was divided in the middle, the Atlantic side being forest, the Pacific side savannah and open grass-land; Chontales lay on the edge of the Atlantic belt of forest, and in consequence of the development of the mines there had been considerable felling of timber, and most of Mr. Belt's Coleoptera were brought to him by the wood-cutters: there were some very fine forms of Stenaspis, Colobothea, Amphionycha, Oncideres, Anisocerus, &c., &c., and it seemed as if the tropical types culminated in size and beauty in Nicaragua. So far as American Coleoptera were concerned (though he could not say that he had observed the same thing in other orders), it seemed that at and near the Equator the species were comparatively dull in colour, but brighter hues were assumed both in the North and South tropics.

Mr. A. R. Wallace thought this held good in the East also. The beetles of Borneo were generally dull in colour, whilst more brilliant forms were found both in Ceylon and China, in Java and Australia. The excessive uniformity in the character of the vegetation was perhaps the cause of the prevailing dullness of the beetles found within the equatorial belt.

By an unanimous vote the Secretary was requested to express to the Rev. T. A. Marshall, on behalf of the Members of the Society, their sympathy and condolence with him on the recent loss, through the foundering of a ship between Melford Haven and Barnstaple, of the whole of his library and manuscripts and collection of insects. The destruction of his minute British Hymenoptera belonging to groups but little studied, and of the types of species characterized by Mr. Marshall, was more than a private misfortune, and was an irreparable loss to Science.

Paper read.

The following paper was read:—"Description of a new Genus and Species of Prionidæ," by Mr. Edmund Thomas Higgins.

The new form was named Ommatomenus sericatus, was allied to Tithoes and Dorycera, and was described as connecting the Acanthophorus group of the Old World with the Derobrachus group of the New World. It was found near the mouth of the Niger, and the Acanthophorus megalops of Mr. Adam White, from Fernando Po, was indicated as belonging to the genus Ommatomenus.—*J. W. D.*

The Elephant and the Railway.—A correspondent writing to the 'Indo-European Correspondence' from Monghyr, under date the 21st ult., states that "A very serious accident, brought about in a manner unknown and perhaps unheard of since the establishment of railways, not only in India, but throughout the world, happened to a train last evening at half-past 8 P.M., between Sahebgunge and Mirzapore, about two miles from the latter station. At that time the No. 5 down goods train was approaching a mangoe tope, in which some seventy elephants were stationed. The red lights glaring in the distance, and the noise and smoke of the engine, would seem to have caused an awful consternation among the poor brutes, all of whom more or less tried to break away from their fastenings. One large male, however, the strongest and most courageous of the lot, became so infuriated that he broke his chain and rushed forward to intercept and encounter the supposed enemy. He had scarcely placed himself on the line when the train was down upon him: he encountered it with head and tusks; but animal strength proved no match for steam and machinery—the poor brute was knocked down and killed on the spot, and the engine, rebounding, ran off the line, and it and eleven carriages were capsized into a ditch. The fireman luckily managed to jump off in time, and the guard did the same, but the poor driver, named Smith, remained in his place, and received injuries from which it is not expected he will recover.

16 MH69

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